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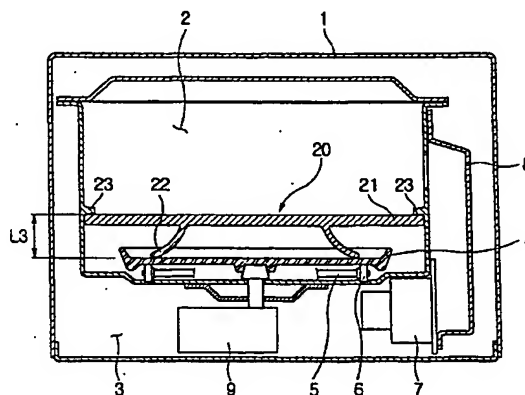
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(54) **Microwave oven with turntable securing means**

(57) A microwave oven includes a turntable holding unit (20; 30) which stably holds both a cooking tray (4) and a tray guide (5) at their original positions regardless of vibrations and impacts applied to the cooking tray and/or tray guide. In one embodiment, the tray holding unit (20) includes a base part (21), and elastic blade parts (22) projecting from a lower surface of the base part (21) and extending downwards and outwards. A stop rail (23) is horizontally formed along an inner surface of left and right sidewalls of a cooking cavity (2) of the microwave oven, so as to stop top edges of the base part (21) and allows the blade parts to press down on the cooking tray (4). Accordingly, the cooking tray (4) and the tray guide (5) are stably held down by the tray holding unit (20).

FIG. 3



EP 1 335 636 A2

Description

[0001] The present invention relates to a microwave oven including a cooking chamber and a turntable removably located in the cooking chamber.

[0002] Microwave ovens are typically designed to be operated by AC power and used in kitchens having an AC power supply. However, in recent years, DC operated microwave ovens have become available for use both indoors (at home or in restaurants) and outdoors (in vehicles or boats).

[0003] Figure 1 shows the construction of a conventional microwave oven. The conventional microwave oven comprises a cabinet 1 which defines the external appearance of the microwave oven and houses a cooking chamber 2 with an opening at front and used for receiving food to be cooked. An electrical component compartment 3 is housed by the cabinet 1 below the cooking chamber 2 and holds a variety of devices used for generating microwaves, which are transmitted into the cooking chamber 2 to heat and cook food inside the cooking chamber 2.

[0004] A cooking tray 4 is set on a bottom of the cooking chamber 2 for supporting food. A tray guide 5, with a plurality of rollers 6, is set between the cooking tray 4 and the bottom of the cooking chamber 2 to support the cooking tray 4 rotatably on the floor of the cooking cavity 2.

[0005] Housed in the electrical component compartment 3 are a magnetron 7, which generates microwaves, and a drive motor 9, which rotates the cooking tray 4. The microwave oven also has a waveguide 8 which guides the microwaves from the magnetron 7 to the cooking cavity 2.

[0006] When the microwave oven is operating, microwaves generated from the magnetron 7 are transmitted into the cooking chamber 2 through the waveguide 8, while the cooking tray 4, carrying with food, is rotated by the drive motor 9. The cooking tray 4 is rotated slowly and the food is heated and cooked by the microwaves.

[0007] In such a conventional microwave oven, the tray guide 5 is simply laid on the floor of the cooking cavity 2, and so it is undesirably movable in horizontal and vertical directions. In addition, the cooking tray 4, which is coupled to a rotating shaft of the drive motor 9, is laid on the rollers 6 of the tray guide. Thus, the cooking tray 4 is also undesirably movable in horizontal and vertical directions. Therefore, the cooking tray 4 and the tray guide 5 may be forcefully moved from their original positions so as to be damaged or broken while being transported by, for example, a moving vehicle. In addition, when the cooking tray 4 and the tray guide 5 are move about due to the movement of a carrying vehicle (e.g. a mobile home), they make disturbing noises.

[0008] A microwave oven according to the present invention is characterised by a removable, elastically shortenable turntable securing device in contact with the turntable and the fabric of the cooking chamber such

that, by means of its elasticity, it secures the turntable in place.

[0009] In an embodiment, stops project from internal side walls of the cooking chamber and the securing device butts against said stops and, preferably, first and second stops project from opposite side walls of the cooking chamber and the securing device comprises a member extending between the undersides of said stops and elastically deformable leg means projecting from said member and pressing against the upper surface of the turntable.

[0010] In another embodiment, the securing device is telescopic and, preferably, comprises a first cylindrical member inserted telescopically into a second cylindrical member and a spring located within the first and second cylindrical members so as to bias them in an extended condition.

[0011] Embodiments of the present invention will now be described, by way of example, with reference to Figures 2 to 5 of the accompanying drawings, of which:

Figure 1 is a sectional view of a conventional microwave oven;

Figure 2 is a perspective view of a first tray holding unit according to the present invention;

Figure 3 is a sectional view of a microwave oven with the tray holding unit of Figure 2 installed;

Figure 4 is a perspective view of a second tray holding unit according to the present invention; and

Figure 5 is a sectional view of a microwave oven with the tray holding unit of Figure 4 installed.

[0012] Referring to Figure 2, a tray holding unit 20 comprises a strip 21, which is an elongate panel-shaped part that is horizontal when the unit 20 is in use. Two elastic blade parts 22 project from the underside of the strip 21 part way along the strip from respective ends thereof. The blade parts 22 are directed somewhat towards respective ends of the strip 21.

[0013] The strip 21 and the two blade parts 22 are made of a material having elasticity and high strength, such as a plastic material, and formed as a single structure.

[0014] Referring also to 3, the length W1 of the strip 21 is almost equal to the width of the cooking chamber 2. With the unit 20 installed, the two blade parts 22 press down on the cooking tray 4. The gap W2 between the free ends of the two blade parts 22 is set to be shorter than the diameter of the cooking tray 4.

[0015] It is necessary for the strip 21 to have high strength and for the two blade parts 22 to have high elasticity. In order to accomplish the above object, the strip 21 is thicker than the two blade parts 22. Accordingly, the tray holding unit 20 elastically deforms in response to an external pressing force. That is, when a user applies, for example, an upward pressing force to the two blade parts 22 while holding the base part 21 with two hands, the two blade parts 22 are elastically deformed

and bend upward to be closer to the base part 21 and enlarge the gap W2 between them as shown by the two-dot chain lines of Figure 2. When the upward pressing force is removed from the two blade parts 22, the blade parts 22 are elastically restored to their original shapes and positions.

[0016] In other words, the two blade parts 22 of the tray holding unit 20 are each elastically deformed within a range determined by the subtraction of a reduced height L2, between the end of each blade part 22 and the top surface of the strip 21 as the blade parts 22 are pressed upward, from the original height L1 of the tray holding unit 20 when the blade parts 22 are not pressed.

[0017] The cooking tray 4 is installed at the bottom of the cooking chamber 2 of the microwave oven with a tray guide 5, having rollers 6, set between the cooking tray 4 and the floor of the cooking cavity 2. The tray guide 5 supports the cooking tray 4 rotatably at the bottom of the cooking cavity 2.

[0018] Two horizontal stop rails 23 are formed at the same height along the left and right sidewalls of the cooking chamber 2. The two stop rails 23 stop the opposite top edges of the base part 21 to hold the tray holding unit 20 in the cooking cavity 2.

[0019] The height L3 between the lower surfaces of the stop rails 23 and the top surface of the cooking tray 4 is less than the original height L1 of the unloaded tray holding unit 20, and greater than the reduced height L2 of the tray holding unit 20.

[0020] In order to install the tray holding unit 20 in the cooking chamber 2 to hold the cooking tray 4 and the tray guide 5 in their original positions while the microwave oven is being transported, the tray holding unit 20 is inserted in the space between the two stop rails 23 and the cooking tray 4 inside the cooking chamber 2, while the two blade parts 22 are manually pressed upward to reduce the height of the tray holding unit 20 to the reduced height L2. When the tray holding unit 20 has been inserted, the blade parts 22 are released. The released blade parts 22 spring towards their rest positions and come into contact with the tray 4. The blades 22 press against the tray 4 urging the ends of the strip 21 up against the undersides of the stop rails 23. Therefore, the cooking tray 4 and the tray guide 5 are held by the tray holding unit 20, which also effectively absorbs vibrations and impacts applied to the cooking tray 4 and the tray guide 5. The cooking tray 4 and the tray guide 5 are maintained at their desired positions and thereby protected from damage regardless of the vibrations and the impacts to which they are subjected.

[0021] To use the microwave oven for heating or cooking food, the tray holding unit 20 is removed from the cooking chamber 2 while pressing the two blade parts 22 upward. The removal of the tray holding unit 20 from the oven is simple to accomplish.

[0022] Referring Figure 4, another tray holding unit 30 comprises inner and outer cylindrical parts 32, 31. The outer cylindrical part 31 is a hollow cylindrical body,

which is closed at its upper end but open at its lower end. The inner cylindrical part 32 is a hollow cylindrical body, which is open at its upper end but closed at its lower end. The open end of the inner cylindrical part 32 is axially inserted into the open end of the outer cylindrical part 31, thus forming a telescopic cylinder assembly. An elastic member 33 is axially set in the telescopic cylinder assembly such that the closed ends of the two cylindrical parts 31, 32 stop both ends of the elastic member 33.

[0023] An upper horizontal annular flange 34 is formed around the closed end of the outer cylindrical part 31 and two tabs 35 extend horizontally outward at the open end of the outer cylindrical part 31 from diametrically opposite positions. Two vertical guide slots 36 are formed in the sidewall of the outer cylindrical part 31 opposite each other.

[0024] While in the present example, there are two guide slots 36 is set to two, it is understood that the number of the vertical guide slots 36 is not limited to two and that three or more guide slots may be formed on the sidewall of the outer cylindrical part 31.

[0025] Two guide protrusions 37 project outwardly from the open end of the inner cylindrical part 32 at diametrically opposite positions, and engage with respective ones of the two guide slots 36 in the outer cylindrical part 31, when the inner cylindrical part 32 is axially inserted into the outer cylindrical part 31 to form the telescopic cylinder assembly. In the telescopic cylinder assembly, the two cylindrical parts 31, 32 can telescopically extend and contract axially but are normally biased in the fully extended state by the elastic member 33. In such a case, the extension of the two cylindrical parts 31, 32 from each other is limited by the engagement of the guide protrusions 37 with the ends of the guide slots 36.

[0026] A compression coil spring may be used as the elastic member 33.

[0027] A lower horizontal annular flange 38 is continuously formed around the closed end of the inner cylindrical part 32 so as to complement the flange 34 on the outer cylindrical part 31. A rubber sheet 39 is attached to an outer surface of the closed ends of the two cylindrical parts 31, 32, and allows the tray holding unit 30 to be stably positioned at its desired place inside the cooking chamber 2 of the microwave oven without slip-page.

[0028] In the present embodiment, the two cylindrical parts 31, 32 are made of a plastic material, which is light, somewhat elastic and suitably strong. When the two cylindrical parts 31, 32 are assembled to each other to form a single body, the open end of the inner cylindrical part 32 is axially inserted into the open end of the outer cylindrical part 31, slightly expanding the open end of the outer cylindrical part 31 and slightly compressing the open end of the inner cylindrical part, after axially seating the elastic member 33 inside the two aligned cylindrical parts 31, 32. As described above, the two cylin-

drical parts 31, 32 are assembled to each other to form the tray holding unit 30 with the two guide protrusions 37 of the inner cylindrical part 32 engaging with the two guide slots 36 of the outer cylindrical part 31.

[0029] As the tabs 35 of the outer cylindrical part 31 are pushed downward relative to the inner cylindrical part 32, after assembling the two cylindrical parts 31, 32 into a single structure, the outer cylindrical part 31 is axially moved downward relative to the inner cylindrical part 32 while the elastic member 33 is compressed. When the pushing force is removed from the two tabs 35, the outer cylindrical part 31 is elastically moved upward to its original position relative to the inner cylindrical part 32 by a restoring force of the elastic member 33.

[0030] Where no force is applied to the tabs 35, the original height L4 between the closed ends of the two cylindrical parts 31, 32 is slightly longer than the height L6 between a ceiling of the cooking chamber 2 and a top surface of the cooking tray 4 (see Figure 5). Where the tabs 35 are fully pressed down, the reduced height L5 of the tray holding unit 30 is slightly shorter than the height L6 between the ceiling of the cooking chamber 2 and the top surface of the cooking tray 4.

[0031] In order to install the tray holding unit 30 in the cooking chamber 2 to hold the cooking tray 4 and the tray guide 5 in their original positions, the tray holding unit 30 is seated in the space between the ceiling of the cooking chamber 2 and the top surface of the cooking tray 4 while axially pressing the tabs 35 down to reduce the height of the tray holding unit 30. When the pushing force is removed from the tabs 35 after seating the tray holding unit 30 at a desired position inside the cooking cavity 2, the outer cylindrical part 31 is moved upward relative to the inner cylindrical part 32 by the restoring force of the elastic member 33. In such a case, the closed end of the outer cylindrical part 31 is stopped by the ceiling of the cooking cavity 2, while the closed end of the inner cylindrical part 32 presses the cooking tray 4 and the tray guide 5 downward. Consequently, the cooking tray 4 and the tray guide 5 are elastically held by the tray holding unit 30, which also effectively absorbs vibration and impact applied from the outside to the cooking tray 4 and the tray guide 5. The cooking tray 4 and the tray guide 5 are thus able to maintain their desired positions without being moved or damaged by vibration and impacts.

[0032] To use the microwave oven for heating or cooking food, the tray holding unit 30 is removed from the cooking chamber 2 by axially pressing the two tabs 35 of the outer cylindrical part 31 down to reduce the height of the tray holding unit 30. Therefore, removal of the tray holding unit 30 from the microwave oven is simple to accomplish.

[0033] As described above, the present invention provides a microwave oven provided with a tray holding unit which stably holds the cooking tray and the tray guide of the microwave oven so as to prevent the cooking tray and the tray guide from undesirably moving from their

original positions regardless of vibration and impact applied to the microwave oven as the microwave oven is transported by a moving vehicle. Thus, the cooking tray and the tray guide of this microwave oven do not generate frictional noise, and are not damaged regardless of such vibration and impact. The microwave oven having the tray holding unit of this invention thus has an improved operational reliability and improved market competitiveness.

[0034] It is also understood that other types of ovens, such as portable toaster ovens and convention ovens, can be provided with a tray holding unit of the present invention to secure a cooking tray from moving regardless of vibration and impact applied to the cooking tray of such ovens.

Claims

1. A microwave oven including a cooking chamber (2) and a turntable (4, 5) removably located in the cooking chamber (2), **characterised by** a removable, elastically shortenable turntable securing device (20; 30) in contact with the turntable (4, 5) and the fabric (23; 39) of the cooking chamber such that, by means of its elasticity, it secures the turntable (4, 5) in place.
2. A microwave oven according to claim 1, wherein stops (23) project from internal side walls of the cooking chamber (3) and the securing device (20) butts against said stops (23).
3. A microwave oven according to claim 2, including first and second stops (23) projecting from opposite side walls of the cooking chamber (2), wherein the securing device comprises a member (21) extending between the undersides of said stops (23) and elastically deformable leg means projecting from said member and pressing against the upper surface of the turntable (4, 5).
4. A microwave oven according to claim 1, wherein the securing device (30) is telescopic.
5. A microwave oven according to claim 4, wherein the securing device (30) comprises a first cylindrical member (32) inserted telescopically into a second cylindrical member (36) and a spring (33) located within the first and second cylindrical members (32, 36) so as to bias them in an extended condition.
6. A microwave oven, comprising:
 - a cabinet which forms an appearance of the microwave oven;
 - a magnetron which generates microwaves and contained in the cabinet;

a cooking cavity defined inside the cabinet for containing food therein;
 a tray guide having rollers and rotatably set in the cooking cavity;
 a cooking tray laid on the rollers of the tray guide; and
 a tray holding unit which holds the cooking tray at a position to prevent the cooking tray from moving regardless of vibration or impact applied to the cooking tray.

7. The microwave oven according to claim 5, wherein the tray holding unit comprises:

a base part which extends in a horizontal direction; and
 elastic blade parts which are formed on a lower surface of the base part and extend downward from the lower surface of the base part while being inclined outward at an angle of inclination.

8. The microwave oven according to claim 7, further comprising a stop rail which is horizontally formed along inner sidewalls of the cooking cavity at a position vertically spaced apart from the cooking tray by a predetermined height, wherein the stop rail stops a top edge of the base part, and the elastic blade parts bias against the cooking tray so as to hold and not allow movement of the cooking tray and the tray guide.

9. The microwave oven according to claim 8, wherein the predetermined height between the stop rail and the cooking tray is shorter than a height of the tray holding unit in response to the elastic blade parts not being pressed, and longer than the height of the tray holding unit in response to the elastic blade parts being elastically pressed to a maximum state.

10. The microwave oven according to claim 5, wherein said tray holding unit comprises:

a hollow inner cylindrical part having an opening at a first end thereof;
 a hollow outer cylindrical part having an opening at a first end thereof and fitted over the first end of the hollow inner cylindrical part; and
 an elastic member provided to the hollow inner and outer cylindrical parts, wherein:

both ends of the elastic member are respectively stopped by a second end of the hollow inner cylindrical part and a second end of the hollow outer cylindrical part so as to allow the hollow inner and outer cylindrical parts to be axially movable relative to each other in opposite directions, and

the tray holding unit prevents moving of the cooking tray and the tray guide in response to the second end of the hollow inner cylindrical part being seated on the cooking tray and the second end of the hollow outer cylindrical part being biased against a top wall of the cooking cavity.

11. The microwave oven according to claim 10, wherein:

the hollow outer cylindrical part includes guide slots having a length and are formed on a side-wall of the hollow outer cylindrical part; and
 the hollow inner cylindrical part includes guide protrusions formed at the first end of the hollow inner cylindrical part, whereby the hollow inner and outer cylindrical parts are assembled with each other by engagement of the guide protrusions with the guide slots.

12. The microwave oven according to claim 11, wherein the hollow outer cylindrical part further includes push handles which extend outward from the first end of the hollow outer cylindrical part so as to push the outer cylindrical part toward the hollow inner cylindrical part.

13. The microwave oven according to claim 10, wherein the tray holding unit includes a rubber sheet attached to each of a second end surface of the hollow outer cylindrical part and a second end surface of the hollow inner cylindrical part to prevent the end surfaces from slippage.

14. The microwave oven according to claim 10, wherein the elastic member is a coil spring.

15. The microwave oven according to claim 6, wherein the tray holding unit is removably secured in the cooking cavity.

16. A removable tray holding unit for securing a cooking tray in a cooking cavity of an oven having a stop rail provided to the cooking cavity, comprising:

a base part which extends in a horizontal direction and includes a top edge; and
 elastic blade parts which are formed on a lower surface of the base part and extend downward from the lower surface of the base part while being inclined outward at an angle of inclination, wherein the elastic parts selectively bend to provide a biasing force to bias the top edge of the base part against the stop rail of the oven and ends of the elastic blade parts against the cooking tray, so as to secure the cooking tray in an original position.

17. A removable tray holding unit for securing a cooking tray in a cooking cavity of an oven, comprising:

a hollow inner cylindrical part having an opening at a first end thereof;
a hollow outer cylindrical part having an opening at a first end thereof and fitted over the first end of the hollow inner cylindrical part; and
an elastic member provided to the hollow inner and outer cylindrical parts, wherein:

both ends of the elastic member are respectively stopped by a second end of the hollow inner cylindrical part and a second end of the hollow outer cylindrical part so as to allow the hollow inner and outer cylindrical parts to be selectively movable relative to each other in opposite axial directions, and
the tray holding unit prevents moving of the cooking tray in response to the second end of the hollow inner cylindrical part being seated on the cooking tray and the second end of the hollow outer cylindrical part being biased against a top wall of the cooking cavity.

18. The removable tray holding unit according to claim 17, wherein:

the hollow outer cylindrical part includes guide slots having a length and are formed on a portion of a sidewall of the hollow outer cylindrical part; and
the hollow inner cylindrical part includes guide protrusions formed on a portion of a sidewall of the hollow inner cylindrical part, whereby the hollow inner and outer cylindrical parts are assembled with each other by engagement of the guide protrusions with the guide slots.

19. The removable tray holding unit according to claim 18, further comprising at least one push handle formed on another portion of the sidewall of the hollow outer cylindrical part and/or on another portion of the sidewall of the hollow inner cylindrical part, so as to push the hollow outer cylindrical part toward the hollow inner cylindrical part.

20. The removable tray holding unit according to claim 17, wherein the removable tray holding unit includes a rubber sheet attached to each of a second end base surface of the hollow outer cylindrical part and a second end base surface of the hollow inner cylindrical part to prevent the end base surfaces from slippage.

21. The removable tray holding unit according to claim

17, wherein the elastic member is a coil spring.

22. An oven, comprising:

a heating source to cook food;
a cooking cavity for containing the food therein;
a cooking tray provided to the cooking cavity; and
a removable tray holding unit which secures the cooking tray from moving from an original position.

23. The oven according to claim 22, wherein the removable tray holding unit comprises:

a base part which extends in a horizontal direction; and
elastic blade parts which are formed on a lower surface of the base part and extend downward from the lower surface of the base part while being inclined outward at an angle of inclination.

24. The oven according to claim 22, further comprising at least one stop rail which is formed along sidewalls of the cooking cavity at a corresponding position vertically spaced apart from the cooking tray by a predetermined height, wherein the stop rail stops a top edge of the base part, and the elastic blade parts bias against the cooking tray so as to hold and not allow movement of the cooking tray.

25. The oven according to claim 22, wherein the removable tray holding unit comprises:

a hollow inner cylindrical part having an opening at a first end thereof;
a hollow outer cylindrical part having an opening at a first end thereof and fitted over the first end of the hollow inner cylindrical part; and
an elastic member provided to the hollow inner and outer cylindrical parts, wherein:

both ends of the elastic member are respectively stopped by a second end of the hollow inner cylindrical part and a second end of the hollow outer cylindrical part so as to allow the hollow inner and outer cylindrical parts to be selectively movable relative to each other in opposite axial directions, and
the tray holding unit prevents moving of the cooking tray in response to the second end of the hollow inner cylindrical part being seated on the cooking tray and the second end of the hollow outer cylindrical part being biased against on a top wall of the cooking cavity.

FIG. 1
(PRIOR ART)

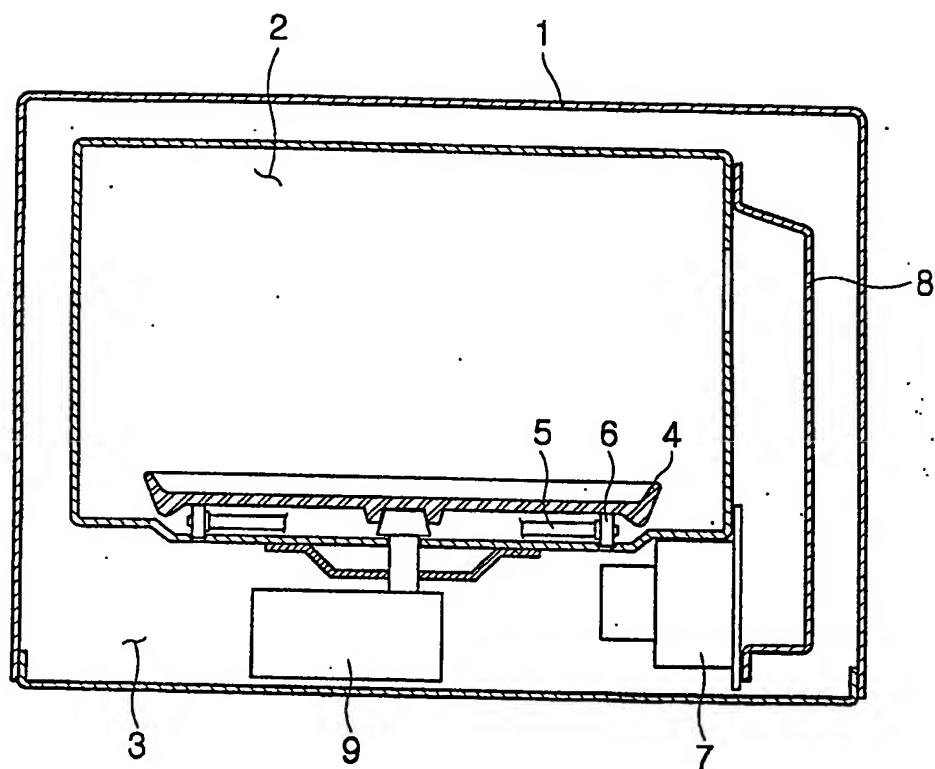


FIG. 2

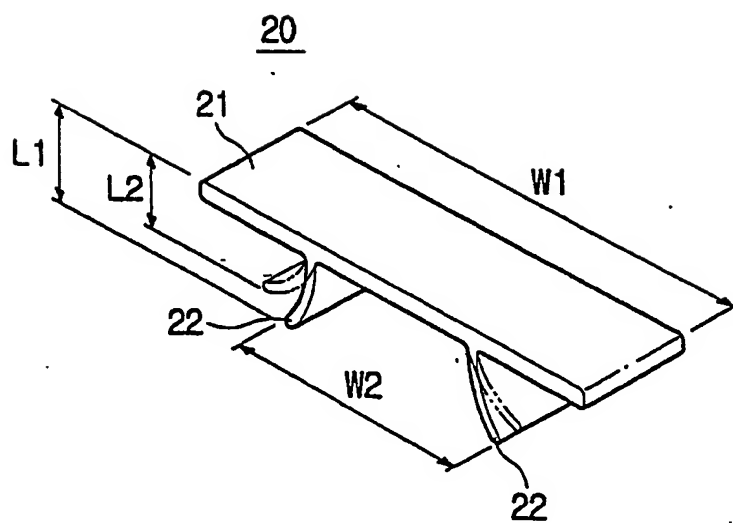


FIG. 3

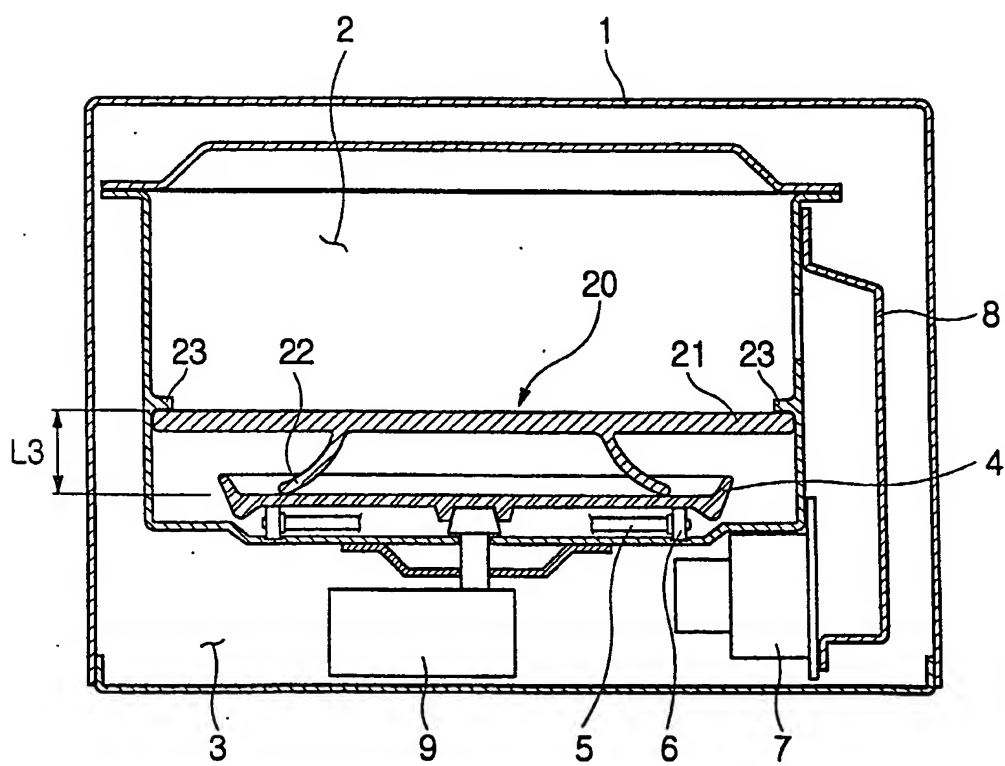


FIG. 4

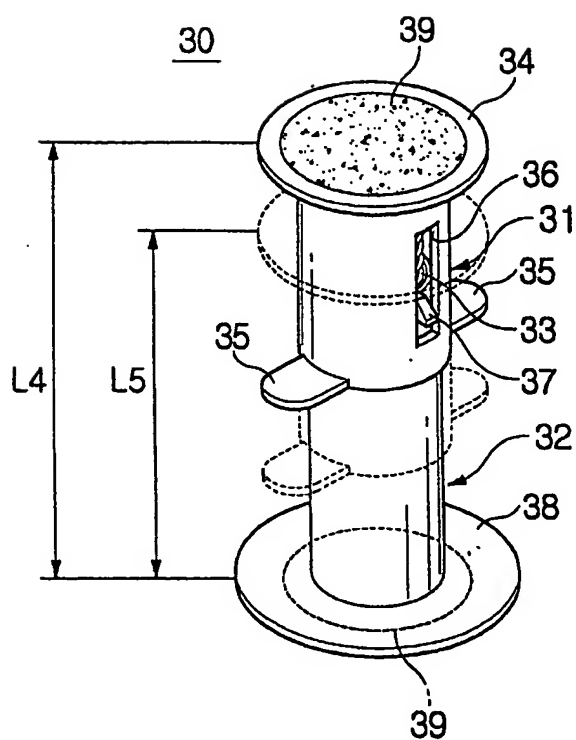


FIG. 5

